

## PATENT ABSTRACTS OF JAPAN

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## (54) RECYCLING METHOD OF PRINTED BOARD

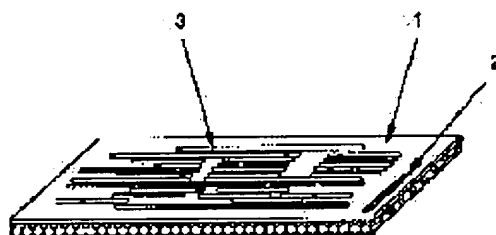
## (57)Abstract:

PURPOSE: To reduce the amount of waste product to be discharged to a minimum, and facilitate the recycle of mounting components, and the recovering/ recycling of

4 metal like conductor and solder, by reading and displaying the codes showing the current application period to a printed board and the decomposing method and the manufacturing method of a printed board.

CONSTITUTION: The contents of a bar code 2 are as follows. The first 2 digits are the code showing a recycling method. The second 3 digits are the code showing a manufacturing country. The third 5 digits are the code showing a responsible manufacturer, the fourth 6 digits are the code showing the manufacturing date, and the fifth 8 digits are the printed board discrimination

code. The bar code 2 is stuck on the surface or the back of a printed board 1. The treating method of a printed board 1 detached from an OA equipment or a domestic electrical equipment is classified according to the code showing the recycling method, in the decomposing process. The first decision reference is the absolute amount of heavy metal or the like represented by lead and shown by the first digit. The second digit is the code showing the structure of a printed board. According to the code, the treating method of a mounting component and a printed board is decided.



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## DETAILED DESCRIPTION

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[Detailed Description of the Invention]

[0001]

[Industrial Application] this invention relates to the recycling by harmless-ized processing and recycling of an electrical machinery and apparatus, and relates to the recycling method of the detailed printed circuit board broadly used for an electrical machinery and apparatus.

[0002]

[Description of the Prior Art] The printed circuit board is used for almost all electrical machinery and apparatus. The recovery by cutting of a connection terminal area with the connector for which the valuable metal (mainly gold : Au) is used about recycling of this printed circuit board was a subject. Processing of crushing and laying the whole underground is performed except the connection terminal area. Moreover, the discernment display of a printed circuit board is [ that the code in which a manufacture maker does not have texture \*\*\*\*\* freely is only attached, and ], and had not become the gestalt which can be referred to in case it recycles and disposes.

[0003]

[Problem(s) to be Solved by the Invention] in this invention, the waste emitted to earth environment like spallation / laying-under-the-ground processing of all the printed circuit boards currently carried out with the conventional technology was reduced as much as possible, and it aimed at making easy recovery and reuse of a metal which are recycling of loading parts, and a conductor and solder

[0004]

[Means for Solving the Problem] the parts carried on the substrate as an example with reference to the decomposition method which lost the fault of the conventional technology described above in this invention, and was indicated by the printed circuit board -- heating -- the total -- from a circuit pattern portion -- bundling up -- removing -- the design information of a circuit -- being based -- removal -- parts are classified for every property of the bottom, and it reuses as parts of a printed circuit board It considers as the structure which can be torn off from the base portion of a printed circuit board also about a circuit pattern, and considers as the gestalt which is made to increase a metal component rate and is easy to put on metaled recovery / recycling root.

[0005]

[Function] According to this invention, it can prevent emitting detrimental heavy metal, such as lead, to natural environment by considering as the gestalt which is made to increase the base portion of a printed circuit board, separation sushi, and a metal component rate, and is easy to put an electric conduction pattern and solder on metaled recovery / recycling root. Furthermore, mixing of the metallic element to the base portion of a printed circuit board is also prevented, and it becomes possible to raise recovery / recycling nature of a base portion. It becomes possible to decrease sharply the detrimental object which printed circuit board material emits to natural environment according to these complex effects.

[0006] moreover, it is also possible in manufacturing a new electronic-circuitry substrate, in order to consider as a secondary effect and to reuse parts to perform cost reduction by securing a certain amount of scale It is possible to reduce the part quantity of production, though the amount of circulation of a

product is secured, and though a manufacture is maintained, curtailment of manufacture energy is possible. Curtailment of the amount of the carbon dioxide discharged can also be expected by this, and it is set to one of the leading solutions about a global warming inclination problem.

[0007]

- 1 [Example] The bar code was used as a display mechanism of this invention. About the reading, technical establishment of the bar code has already been carried out, and the precision is very stable. The content of a code was the code with which 2 figures of the beginning express the recycling method, the following 3 figures considered as the country-of-origin code, and the 5 next figures considered as a responsibility manufacturer code, the date of manufacture of 6 more figures, and the printed circuit board identification code of 8 figures. About the number of digits of these codes, and the sequence of the content to display, it is not this limitation, and there may be addition codes, such as a code of the material of construction, or an ellipsis further.

- 2 [0008] As shown in drawing 1, this bar code 2 is stuck on the front face or rear face of a printed circuit board 1. The art is classified according to the code in which the printed circuit board removed from OA equipment or the homeuse-electronics product shows the recycling method the decomposition process.
- 4 The first criterion is the absolute magnitude of the heavy metal represented by the lead which has a bad influence on environment, when it sees as the whole printed circuit board. When absolute magnitude is almost 0, it can be judged as the level which can crush, reclaim land from and carry out the whole. The 1st figure of the code showing the recycling method expressed the rank of the absolute magnitude of a heavy-metal content as shown in the next table 1 with this example.

[0009]

[Table 1]

| コード | 含有絶対量 |
|-----|-------|
| 0   | ＜ P R |
| 1   | ＜ n R |
| 2   | ＜ μ R |
| 3   | ＜ m R |
| 4   | ＜ R   |
| 5   | ＞ R   |

[0010] It expresses whether the 2nd figure tears [ again / the circuit pattern portion of a printed circuit board ] off from the base portion of a substrate and is possible in whether it is the surface mount which does not have the metal rod which pierces through a substrate as a code showing the structure of a printed circuit board. Thereby, the art of loading parts and a printed circuit board is determined. In this example, it considered as the code as shown in Table 2.

[0011]

[Table 2]

| コード | 普通接線無はんだ | 普通接線有金属棒 | 普通接線有回路引き刺がし可 |
|-----|----------|----------|---------------|
| 0   | ○        |          | ○             |
| 1   |          | ○        | ○             |
| 2   |          |          | ○             |
| 3   | ○        |          | ×             |
| 4   |          | ○        | ×             |
| 5   |          |          | ×             |

[0012] Here, about a circuit pattern tearing off, it is based on the structure of a printed circuit board. By making it a thing as shows the structure of a printed circuit board to drawing 2, it becomes possible to dissociate from the base portion 4 of a substrate. Drawing 2 shows the manufacture method of a printed circuit board, and structure. The 1st process in drawing 2, the through hole 12 for connection of an upper surface inferior-surface-of-tongue layer is formed in insulating films, such as epoxy with a thickness of about 0.05mm, polystyrene (PS), or a polyimide, and a bar code 2 is printed. Even if it prints in the first stage about this bar code, after the whole printed circuit board is done, even if it prints, there is essentially no difference. Moreover, there is no difference in a function about that by which the

bar code was already printed [ printing or ] also at pasting \*\*\*\*\*. In the 2nd process, a circuit pattern is formed in film one side or both sides, and a solder resist is applied after that. In the 3rd process, parts are carried, and by the reflow of solder etc., while carrying out the soldered joint of the parts, an up-and-down wiring layer is connected through a through hole at solder. Then, the circuit board is formed by pasting this circuit film in the 4th process at boards, such as polypropylene (PP) and polystyrene.

[0013] With such structure, it makes it possible to use for other circuit boards LSI6 carried in the front face among printed circuit boards in the 1st process as shown in drawing 3, and the element of resistance 7 and capacitor 7 grade as it is by removing from a circuit. On the other hand, it is thought that the circuit pattern 5 of the same thing being used is very rare, and a reuse generally is not carried out at all. Then, solder is removed as much as possible in the 2nd process as the root reused most effectively. By returning to the level of a raw material by the circuit pattern 9 of this state, the discharge to natural environment is made into the minimum, and it is most excellent to use resources effectively. About the metal matter, since it generally constitutes from copper, if about 30% of content is secured now, since the circuit pattern of a printed circuit board can take profit as a raw material maker, it can be sold off.

[0014] The printed circuit board of this example forms the circuit pattern 5 in an insulating with a thickness of about 20-50 micrometers film top or its both sides by copper plating, and constitutes it by pasting \*\*\*\*\* at the base of a printed circuit board. Although the adhesives 10 used here show sufficient adhesive strength at the time of anticipated use, adhesive strength changes with operations at a next printed circuit board decomposition process lengthen and according [ \*\* ] in consideration of \*\* to one kind or combined use of heat, chemicals, or an electromagnetic wave, and they become possible [ tearing off from the base of a printed circuit board ]. By setting thickness of an insulating film to about 20-50 micrometers, electric connection is simply [ at the time of the reflow of solder ] possible for circuit connection of film both sides by opening a breakthrough in a film.

[0015] When considering as a still more complicated high-density pattern with this printed circuit board composition, electric connection is made to both sides by heating after adhesion through the insulating film which does not have the pattern which formed the breakthrough by the connection in the film of two sheets in which the circuit pattern was formed. If copper density takes into consideration the thing of an insulating film which several times are, such a copper content of only the circuit board portion of a film can be easily considered as about 50%, and can carry out sale processing only of this portion at the maker of a metallic material.

[0016] If it takes into consideration pasting up the film of the circuit pattern 5 which carried out a solder reflow and carried parts about the base portion 4 of a printed circuit board on the other hand, thermal resistance to the extent that it is required of the base of the conventional printed circuit board is unnecessary, and it is possible to use the so-called eco materials, such as polystyrene which performed fireproofing, and a polyp ROPIRO pyrene. As for these eco materials, the recycling root is already materialized. Moreover, if the base portion 4 of a printed circuit board considers only as the function to carry a circuit portion, in this way, the material of the base portion 4 can reduce the amount of the material used, without spoiling mechanical intensity by making it foam, and it is also possible to attain lightweight-ization.

[0017] As mentioned above, it is possible to determine the method of recycling processing in first code of 2 figures. Therefore, if the method of recycling is standardized, it is also possible by referring to this code as which recycling root it considers and to determine uniquely.

[0018] The following code according to [ of 3 figures ] country used the code according to country of an international call. If this code can specify the actual shell and the country of origin which have the precision of material, and the difference in criteria internationally, even if country of manufacture differs from the country which performs processing, it has the advantage that the art in consideration of the difference in the criteria between countries can be performed. As long as there needs to be no code according to this country in code of an international call and is decided on fixed criteria, what thing is sufficient as it.

[0019] The manufacture maker code of 5 figures as follows displays the manufacturer who holds all the

7  
10 data about a design and manufacture of this printed circuit board. this code -- the exception of each country -- or it uses together with the code according to country, and is not registered internationally, and a number of digits is not necessarily fixed Furthermore, the 6 next figures are important when knowing precision/purity, such as regulation in the time of the date of manufacture being shown and manufacturing this printed circuit board, and law or material. The printed circuit board identification code of 8 figures as follows is a code decided based on the criteria defined according to the criteria for every maker which consist of the kind of product used, anticipation environment used, a design code of a printed circuit board, etc., or the country, or the criteria defined internationally. By referring to this code, data, such as all parts currently used and material, and also its arrangement, are obtained.

[0020] As shown in drawing 4 , after tearing off a base portion and a circuit film portion from a printed circuit board by carrying out based on these codes, it is possible by putting the adhesive part receptacle 11 on a surface mount loading part side, and applying heat to a film to collect use parts. Moreover, it is possible to obtain [ apart from printed circuit board identification code ] a real time from change of the color of material etc. using the power supply of a printed circuit board at the time of processing of a printed circuit board by material which produces a chemical change regularly by potential, heat, or the magnetic field. or a printed circuit board top -- Timer IC -- carrying -- a real time -- precision -- getting to know highly is also possible Therefore, it is classified by reference and the collected parts can carry out the reuse of the prediction life expectancy acquired from criteria, the date of manufacture, use anticipation environment of parts at the time of manufacture, etc. to it.

[0021]

[Effect of the Invention] the waste emitted to earth environment like spallation / laying-under-the-ground processing of all the printed circuit boards that are carried out with the conventional technology according to this invention as explained above reduces as much as possible, and it is possible to make easy recycling use of loading parts and a printed circuit board base portion, and recovery and reuse of a metal which are a conductor and solder, and it is effective in decreasing sharply the detrimental object which printed circuit board material emits to natural environment according to these complex effects

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DESCRIPTION OF DRAWINGS

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[Brief Description of the Drawings]

[Drawing 1] It is the conceptual diagram of the printed circuit board by this invention.

[Drawing 2] It is the structure and the method of assembling of the printed circuit board by this invention example.

[Drawing 3] It is the decomposition method of the printed circuit board by this invention example.

[Drawing 4] It is one example of the surface mounted device recovery method by this invention.

[Description of Notations]

1 -- Printed circuit board 2 [ 4 / 6 / 8 / -- The glue line of a circuit pattern and the printed circuit board base, 11 / -- Part receptacle for adhesive passive-circuit-elements recovery / -- A capacitor, 9 -- The circuit pattern after solder removal, 10 / -- An LSI chip 7 -- Resistance element / -- The printed circuit board base, 5 -- Circuit pattern ] -- Printed circuit board identification code, 3 -- Insulating film 12 -- through hole -- a hole

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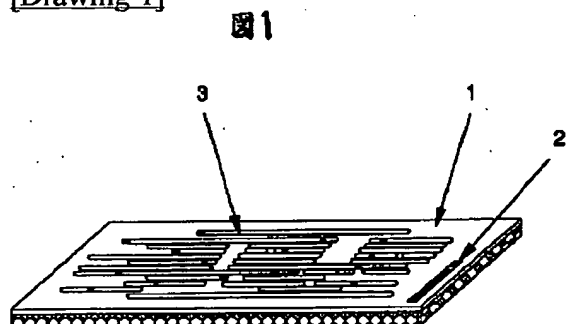
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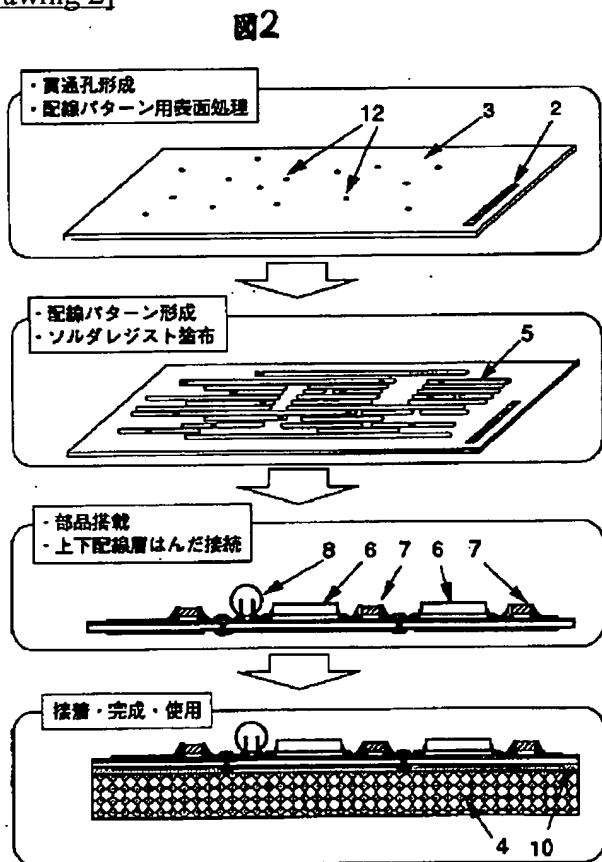
DRAWINGS

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[Drawing 1]



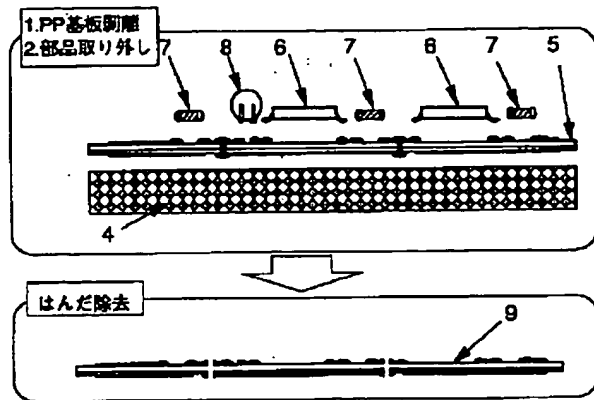
[Drawing 2]



[Drawing 3]

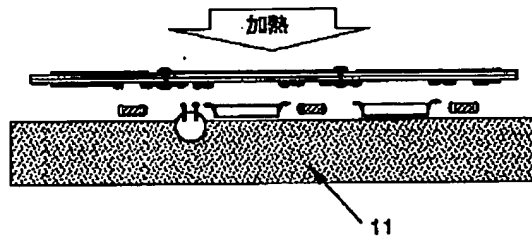


図3



[Drawing 4]

図4



[Translation done.]